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# The impact of rural health system reform on hospitalization rates in the Islamic Republic of Iran: an interrupted time series

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**Objective** To assess the effects on hospital utilization rates of a major health system reform – a family physician programme and a social protection scheme – undertaken in rural areas of the Islamic Republic of Iran in 2005.

**Methods** A “tracer” province that was not a patient referral hub was selected for the collection of monthly hospitalization data over a period of about 10 years, beginning two years before the rural health system reform (the “intervention”) began. An interrupted time series analysis was conducted and segmented regression analysis was used to assess the immediate and gradual effects of the intervention on hospitalization rates in an intervention group composed of rural residents and a comparison group composed of urban residents primarily.

**Findings** Before the intervention, the hospitalization rate in the rural population was significantly lower than in the comparison group. Although there was no significant increase or decline in hospitalization rates in the intervention or comparison group before the intervention, after the intervention a significant increase in the hospitalization rate – of 4.6 hospitalizations per 100 000 insured persons per month on average – was noted in the intervention group ( $P < 0.001$ ). The monthly increase in the hospitalization rate continued for over a year and stabilized thereafter. No increase in the hospitalization rate was observed in the comparison group.

**Conclusion** The primary health-care programme instituted as part of the health system reform process has increased access to hospital care in a population that formerly underutilized hospital services. It has not reduced hospitalizations or hospitalization-related expenditure.

Abstracts in عربي, 中文, Français, Русский and Español at the end of each article.

## Introduction

According to the World Health Organization (WHO), the purpose behind universal health coverage (UHC) is to ensure for all people, whether rich or poor, access to effective health services that meet most of their needs without being exposed to the risk of financial hardship.<sup>1,2</sup> In most low- and middle-income countries, these conditions are not met and the effective health services that are available are not accessible to the entire population.<sup>1,3</sup>

An important prerequisite for UHC is the adequate provision of health services, which depends on factors such as the availability of physicians and hospital beds to meet demand. By adequate service provision we mean the existence of a sufficient number of services of acceptable quality distributed in a manner that allows the population's health-care needs to be fulfilled. People who lack health insurance coverage or another form of financial protection find it very difficult to access health services, especially inpatient care,<sup>4–6</sup> or delay in doing so. This is commonly referred to as the “uninsured access gap”.<sup>7–11</sup> When not enough services are covered under a protection plan or when the financial protection for those services that are “covered” is insufficient, households can be deprived of essential health care or face catastrophic costs.<sup>12</sup> Delayed care can also lead to hospitalizations that could have been avoided with timely treatment.<sup>2,9,13</sup>

Poor access to health care and underutilization of health-care services are problems that may be remedied by expanding primary care and social protection schemes through measures such as social insurance or publicly-funded health care.<sup>1,3</sup> However, social protection schemes have a mixed effect on hospital utilization – in theory at least.<sup>14</sup> By increasing the

use of effective outpatient primary care services, improvements in social protection could reduce hospitalizations that are potentially avoidable – i.e. “primary-care-sensitive” hospitalizations – in what is known as an “efficiency effect”. At the same time, people with better social protection are more likely to be hospitalized when they need to be. This would lead to an increase in “referral-sensitive” hospitalizations in what is termed the “access effect”.<sup>14,15</sup> The efficiency and access effects of social protection materialize only if health service provision is adequate.

## Health-care financing and delivery in rural parts of the Islamic Republic of Iran

Since the mid-1980s, the Islamic Republic of Iran has enjoyed an extensive network of publicly funded primary health-care (PHC) services in rural areas.<sup>16</sup> The network has relied primarily on community health workers (*behvarz*) as first-line service providers. The *behvarz* are selected from the locality where they live, receive training for two years and provide basic services at a “health house”. A health house is a part of the district PHC network. It is staffed by one or two *behvarz* who serve a population of about 1500 on average. A health house offers primary services to mothers and children, including vaccinations, prenatal and postnatal care, growth monitoring, family planning, management of common infectious and chronic conditions, and environmental health services. PHC physicians are based in rural health centres and manage the patients referred to them by the *behvarz*. The PHC network is well organized and is credited with the improvements in health outcomes that have been observed since the 1980s in rural areas.<sup>3,17,18</sup>

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Secondary care services for the Islamic Republic of Iran's rural population have been less easily accessible. Unlike PHC, which is almost entirely financed by the central government, outpatient care is not free and is delivered mostly by private sector professionals in urban areas. Such care includes, for example, visits to non-PHC physicians, specialist visits, laboratory and radiology services and medicines dispensed at private pharmacies. Access to hospital care for rural residents has been hindered by financial and organizational factors and by the lack of a fully implemented referral system.<sup>17</sup> Uninsured rural households used a "rural insurance card" that covered 90% of hospital costs, but only upon referral by a PHC service. The card, which was issued free of charge by the Medical Services Insurance Organization (MSIO), did not cover any outpatient care, apart from the PHC services which were covered by the government funding.

In recent years, concerns have arisen about the PHC's ability to respond to the needs of the population in light of changing epidemiologic trends, such as the increase in chronic diseases.<sup>19</sup> To respond to these changes, in 2005 the Islamic Republic of Iran's parliament approved a reform that substantially increased the national budget for rural health care.<sup>18</sup> The reform covered all villages and towns with populations of up to 20 000 and had two main elements: a family physician programme and a social protection scheme for rural inhabitants (known as "rural insurance").<sup>18</sup> About 6000 physicians and 400 midwives were added to the PHC network in a span of three years as part of the reform.

Since the health system reform process was intended to improve access to more comprehensive preventive and outpatient care, policy-makers expected it to result in a decrease in hospitalizations. Our objective was to

assess the immediate and long-term effect of the reform (henceforth referred to as "the intervention") on hospitalization rates among rural residents, which were the target population.

## Methods

### Study design

The intervention was implemented in June 2005. We conducted an interrupted time series study and analysed: (i) monthly hospitalization rates starting two years before the intervention (2003–2007) to assess its immediate effects; and (ii) monthly hospitalization rates up to September 2012 to assess its long-term effects. An interrupted time series study does not require a concurrent "control group" to establish a causal link between an intervention and an outcome.<sup>20</sup> However, the use of a comparison group can result in a better understanding of the effects of the intervention on the intervention group.<sup>21</sup> For this reason, we used a concurrent series of monthly hospitalization rates for a non-equivalent "comparison group" consisting of primarily urban civil servants and their dependants, who were the target population of another insurance fund also managed by the MSIO.

### Setting

We hypothesized that the intervention would affect hospitalization rates more strongly in areas where households were poor and hence more likely to benefit from the intervention than affluent households. We also needed to select a province that was not a patient referral hub for other provinces. Lorestan, a province in the western part of the Islamic Republic of Iran, met these criteria (Table 1).

### The intervention

The purpose of the intervention was to improve rural households' access to outpatient and hospital care.<sup>19,23</sup> All

households in villages and small towns were eligible to join the social protection scheme by paying a nominal fee – approximately 0.25 United States dollars – that covered the printing costs of the "insurance" booklet. There was no additional cost for remaining in the scheme. Since most rural household members were employed in the informal sector, the majority of rural households joined the scheme. According to data for the province, 92% coverage had been attained within two years.

The intervention improved access to health care at two levels. First, better pay drew more family physicians and midwives to PHC centres. Between 2004 and 2005 the number of PHC physicians in the province increased from 124 to 191.<sup>24</sup> Of the new physicians, many came from the private sector, which they were required to leave to work as a PHC family physician. Others were new graduates or physicians who had previously held managerial posts in the PHC system. Second, households were given access to outpatient services – visits to specialists, radiology services, laboratory and pharmacy services – and to hospital care (located primarily in cities) at a reduced cost. This was facilitated by possession of the "insurance booklet", signed by the referring family physician. Patients referred by a family physician were expected to pay 10% of inpatient costs and 30% of outpatient costs out of pocket; self-referred patients had no financial coverage.

### Data sources

We obtained population data from the Statistics Centre of the Islamic Republic of Iran and social protection coverage and monthly hospitalization data from MSIO records.

The inpatient services provided by the Imam Khomeini Relief Foundation for poor rural households, which existed before the intervention, could have exerted a confounding effect on our results. However, the Relief Fund had ceased to function within two years of the intervention. We obtained from the Relief Fund its monthly hospitalization claims for rural households for the study period – there were none from 2008 onwards – and included them when calculating the number of hospitalizations. We asked experienced officers to check the data for accuracy. We engaged three physicians and PHC managers in the province to verify the accuracy of all dates and activities.

Table 1. **Comparative characteristics of the province of Lorestan and of the country as a whole, Islamic Republic of Iran, 2010**

Characteristic	Province	Country
Population	1 750 000	74 631 000
Urban population, %	62	72
Hospital beds per 10 000	12	13
Population insured under new social protection scheme, no. and (%)	765 000 (44)	23 056 000 (31)

Source: Health Technology Assessment Office, 2010.<sup>22</sup>

Table 2. Hospitalizations in the intervention group and in the non-equivalent comparison group during the study period, Islamic Republic of Iran, April 2003 to September 2012

Parameter	Apr 2003– Mar 2004	Apr 2004– Mar 2005	Apr 2005– Mar 2006	Apr 2006– Mar 2007	Apr 2007– Mar 2008	Apr 2008– Mar 2009	Apr 2009– Mar 2010	Apr 2010– Mar 2011	Apr 2011– Mar 2012	Apr 2012– Sep 2012 <sup>a</sup>
<b>Intervention group</b>										
Population covered by rural protection scheme	710 000	703 717	706 492	694 535	719 224	700 302	700 960	702 991	702 586	703 513
Total number of rural hospitalizations	31 442	32 315	35 171	42 167	47 158	39 482	39 931	40 746	43 878	22 907
Number of rural hospitalizations, monthly average	2 620	2 693	2 931	3 514	3 930	3 290	3 328	3 395	3 656	3 818
Monthly rural hospitalization rate <sup>b</sup>	3.69	3.83	4.15	5.06	5.46	4.7	4.75	4.83	5.2	5.43
<b>Comparison group</b>										
Population covered by MSIO fund for civil servants	130 098	134 862	140 072	144 214	149 180	142 097	145 521	151 126	155 126	158 379
Total number of urban hospitalizations	12 059	13 190	13 378	13 814	14 287	8 340	9 415	11 597	12 225	6 061
Number of urban hospitalizations, monthly average	1 005	1 099	1 115	1 151	1 191	695	785	966	1 019	1 010
Monthly urban hospitalization rate <sup>b</sup>	7.72	8.15	7.96	7.98	7.98	4.89	5.39	6.39	6.57	6.38

MSIO, Medical Services Insurance Organization.

<sup>a</sup> Covers a six-month period.<sup>b</sup> Hospitalizations per 1000 inhabitants.

## Sample size and data analysis

We modelled data using segmented regressions to assess causal links between the intervention and the outcome of interest.<sup>20,21</sup> It takes at least 48 observations in a segmented regression analysis to be able to assess seasonality in the data.<sup>21,25</sup> Our sample included 60 observations (i.e. one per month) – 27 before and 33 after the intervention – to assess the intervention's immediate effects, and a longer time series – 114 observations – to assess its long-term effects.

To eliminate the effects of population growth, we defined each observation as the number of hospitalizations per month divided by the population under coverage during the year (i.e. the hospitalization rates) (Table 2). We looked for abrupt drops or increases in the hospitalization rate and for gradual changes in trends at the interruption times.

We analysed data for the comparison group for the entire study period except for about two years after 2008. This is because during the latter period the MSIO's civil servant fund transferred the care of the elderly population to another insurer and this altered the demographic profile of the population under its coverage.

We conducted several diagnostic assessments. The Durbin-Watson test suggested the existence of autocorrelations, which we corrected using the Cochrane-Orcutt method.<sup>26</sup> We estimated the Kolmogorov-Smirnov statistic to check the normality of the residuals and saw that a power transformation correction was required for the analysis of long-term effects. We estimated the Dicky-Fuller statistic to determine if the series was stationary and the Breusch-Pagan statistic to check for heteroscedasticity in the residuals. The results suggested a normal residual distribution and a lack of seasonality and heteroscedasticity.<sup>26</sup>

The first "interruption" time was set at June 2005, when the intervention was first implemented. To identify the next interruption point, we used segmented regressions with multiple time periods for each point and monitored the time series to find the first point showing a significant change in the trend (Appendix A, available at: [https://docs.google.com/file/d/0B32jQZp\\_KmJze-HFmRUhwRU5ySGs/edit?usp=sharing](https://docs.google.com/file/d/0B32jQZp_KmJze-HFmRUhwRU5ySGs/edit?usp=sharing)). All analyses were conducted using R statistical software version 2.12.1 (The R Foundation for Statistical Computing, Vienna, Austria).

## Results

Over 700 000 inhabitants of rural areas, including small towns, were covered by the intervention, and about 150 000 urban inhabitants were covered by the MSIO fund for civil servants (Table 2). From 2003 to 2007, the annual hospitalization rate in the population covered by the intervention increased from 44.3 to 65.6 per 1000 inhabitants. The corresponding rates in the population covered by the MSIO's fund for civil servants were 92.7 in 2003 and 95.7 in 2007. In 2011, the annual hospitalization rate for the intervention group and the comparison group was 62.5 and 78.8 per 1000 inhabitants, respectively.

### Immediate effect on hospitalization rate

No significant increase or decline in the hospitalization rate was noted in either the intervention or the comparison group before the intervention. The pre-intervention rates remained stable in both groups (Table 3) even though the baseline monthly hospitalization rate per 1000 inhabitants was markedly lower in the intervention group than in the comparison group.

We looked for changes in slope and intercept in the comparison group to check for confounding factors unrelated to the intervention – e.g. disease epidemics, data recording policies at the MSIO – that might have occurred at the same time as the intervention and biased the findings. We observed no significant changes in slope or intercept in the hospitalization rate of the comparison group after the in-

tervention ( $P > 0.4$ ). However, we did note a significant change in the regression slope ( $P < 0.001$ ) in the intervention group right after the intervention started (Table 3). This finding suggests that the intervention resulted in a greater likelihood that people would use hospital services (Fig. 1). To develop the model for the hospitalization rate in the intervention group, we transformed the model back to its original coefficients (after correcting for autocorrelation;  $Y_t - \rho Y_{t-1}$ ). Hence, for Model 1:

$$Y = 0.00423 + (6.709 \times 10^{-6} T) + (4.603 \times 10^{-5} P) + (2.024 \times 10^{-4} D)$$

where  $Y$  is the hospitalization rate,  $\rho$  is the autocorrelation parameter and equals 0.125516;  $T$  is pre-intervention slope;  $P$  is the change in slope and  $D$  is the change in intercept.

According to Model 1, the hospitalization rate in the intervention group increased, on average, by about 4.6 hospitalizations per 100 000 insured people per month. Fig. 1 shows that before the intervention the slope was close to zero but showed a much steeper forward incline after the intervention. Segmented regression analysis conducted in both groups revealed that the post-intervention slopes in the intervention

Table 3. Estimated coefficients of segmented regression model for hospitalization rates in the intervention group and the non-equivalent comparison group before and after the intervention, Islamic Republic of Iran, April 2003 to March 2008

Parameter	Value (SE)	<i>t</i>	<i>P</i>
<b>Intervention group</b>			
Intercept	0.0037 (0.0002)	21.39	0.0000
Pre-intervention slope <sup>a</sup>	0.67E-05 (1.05E-05)	0.64	0.53
Change in slope <sup>b</sup>	4.60E-05 (1.29E-05)	3.58	0.0007
Change in intercept	0.0002 (0.0002)	0.99	0.33
<b>Comparison group</b>			
Intercept	0.0082 (0.0006)	14.38	0.0000
Pre-intervention slope <sup>a</sup>	-1.33e-05 (3.36e-05)	-0.40	0.69
Change in slope <sup>c</sup>	-0.37e-05 (4.17e-05)	-0.09	0.93
Change in intercept	0.0004 (0.0006)	0.74	0.47

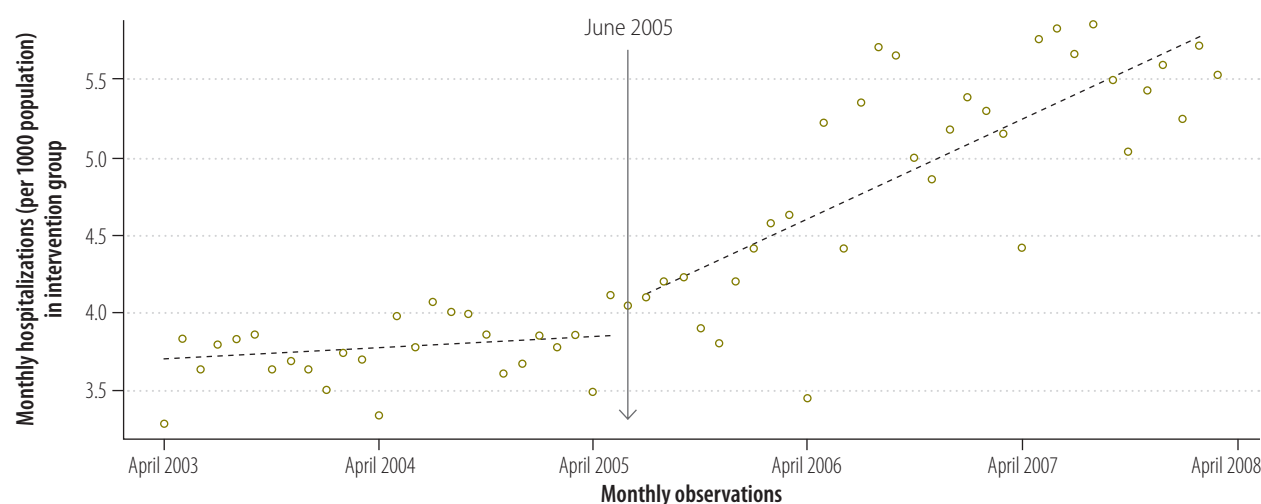
SE, standard error.

<sup>a</sup> Indicates a non-significant rise in the hospitalization rate from month to month before the intervention.

<sup>b</sup> A significant change in the regression slope – indicating a significant increase in the hospitalization rate – was noted in the intervention group right after the intervention.

<sup>c</sup> No significant change in the regression slope – indicating no significant increase in the hospitalization rate – was noted in the comparison group right after the intervention.

Fig. 1. Segmented regression model showing hospitalization rates over the short-term in the intervention group, April 2003 to March 2008



Note: The intervention was implemented in June 2005.



group and the comparison group differed statistically ( $P=0.004$ ). After the intervention, the intervention group had about 7 monthly hospitalizations more per 100 000 insured people than the comparison group (Appendix B, available at: [https://docs.google.com/file/d/0B32jQZp\\_KmJzN3YtWWp-1cXRLbWc/edit?usp=sharing](https://docs.google.com/file/d/0B32jQZp_KmJzN3YtWWp-1cXRLbWc/edit?usp=sharing)).

### Long-term effect on hospitalization rate

In the intervention group we observed a second statistically significant “interruption” point in the trend in hospitalization rate 40 months after the start of the intervention (Fig. 2). At that point the upward trend in the hospitalization rate declined significantly and returning to the modest upward trend that had existed before the intervention started ( $P<0.001$ ). The slopes before the intervention and after the second interruption point were not statistically different ( $P=0.75$ ) (Appendix C, available at: [https://docs.google.com/file/d/0B32jQZp\\_KmJzWUdjS1pGcGpNNzA/edit?usp=sharing](https://docs.google.com/file/d/0B32jQZp_KmJzWUdjS1pGcGpNNzA/edit?usp=sharing)). As a result, the long-term effect of the intervention can be described as an abrupt increase in the hospitalization rate lasting more than one year, followed by a secular upward trend that was comparable to the trend that had existed before the intervention (Fig. 2). Analysis of the comparison group over the long term showed an unexplained significant reduction in the hospitalization rate – seen as a change in the intercept – after 2009 ( $P<0.001$ ).

## Discussion

A family physician programme and a social protection scheme for rural inhabitants in the Islamic Republic of Iran resulted in a modest and statistically significant increase in the hospitalization rate. The upward trend in the rate remained relatively constant for about one year and then began to decline, perhaps under the influence of external factors not observed by our study, since we also noted a reduction in the hospitalization rate in the comparison group at about the same time.

The intervention increased the utilization of hospital beds in a population that had historically underutilized hospital services. This suggests that the “access effect” of the intervention outweighed its potential “efficiency effect”. It appears, therefore, that while family physicians provided rural inhabitants with a “point of referral” to specialists, the social protection scheme increased their actual use of specialists, and, ultimately, of hospital services.

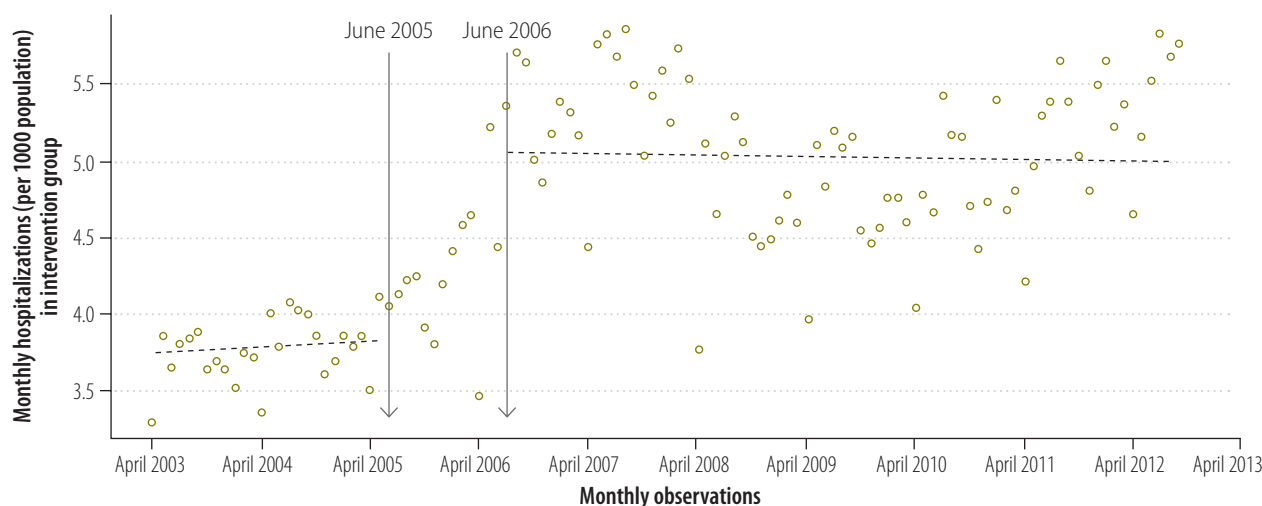
Our results differ from those of previous studies that claim that expanding primary care services – or access to such services – would result in a decrease in the hospitalization rate by reducing primary-care-sensitive hospitalizations.<sup>14,27–32</sup> All such studies but one<sup>32</sup> were conducted in high-income countries with high baseline access to inpatient hospital services and have one major limitation: they focused exclusively on primary-care-sensitive avoidable hospitalizations. Only Friedman & Basu

(2001) measured total hospitalizations and observed a reduction in all hospitalizations among children in the state of New York, United States of America.<sup>31</sup>

Other studies have led to conclusions similar to those derived from ours. In a study in Canada, improving access to primary care resulted in a reduction in primary-care-sensitive hospitalizations among the elderly but did not change total hospitalization rates.<sup>33</sup> In Ireland, Nolan et al. (2011) observed no changes in avoidable hospitalizations as a result of improved access to primary care.<sup>34</sup> A study conducted in the United States revealed that reductions in the hospitalization rate were not linked to the use of primary care services.<sup>35</sup>

Saha et al. (2007) had hypothesized, like we did, that improving access to primary care – by expanding the Medicaid programme in the state of Oregon in the United States to cover an additional 100 000 low-income families – would result in fewer hospitalizations. Instead, they observed an increase in the hospitalization rate.<sup>36</sup> In their study, the baseline hospitalization rate in the intervention group was lower than in the rest of the population. In ours, the hospitalization rate at baseline was also substantially lower in the rural than in the urban population. These findings suggest that the increase in the hospitalization rate that we observed in the rural population reflects a pre-existing unmet need for hospitalizations. We would expect the increase to have occurred in referral-sensitive hospitalizations,<sup>37</sup> although this should be the focus of future studies.

Fig. 2. Segmented regression model showing hospitalization rates over the long term in the intervention group, April 2003 to September 2012



Note: The intervention was implemented in June 2005.

Our study has important methodological strengths. We took advantage of the opportunity to perform a natural experiment and used robust research methods.<sup>19,21</sup> We made certain that all statistical assumptions were met. We also looked for potential confounding influences during the intervention period that might have biased the results and found none. The study involved a relatively large number of observations (months) that resulted in enough power to test the hypothesis and obtain significant results at the desired confidence level.

The study also has important limitations. It was conducted in only one province, whereas ideally it should have been conducted in a nationally representative sample. On the other hand, by focusing on a single province we were able to better monitor data quality and contextual factors that could have influenced hospitalizations in the intervention group. We lacked data on hospitalization length and causes of admission. Future studies

should explore whether hospitalization patterns changed after the rural health system reform.

Our study has important policy implications. If the hospitalization rate in the intervention group had continued to increase for over one year after the intervention as a response to unmet needs, it should have continued to rise until the unmet need was satisfied – i.e. until it had reached a level similar to that in the comparison group. However, the hospitalization rate in the intervention group did not reach the level observed in the comparison group. This is difficult to explain because the two groups were not comparable in terms of demographic or access characteristics. The comparison group was predominantly composed of more affluent urban residents with better geographical access to specialist and hospital care than the intervention group.

To conclude, programmes that focus on improving access to primary care do not necessarily lead to reduced

hospitalization rates and hence to lower hospitalization-related expenditures. Improved accessibility offsets potential efficiency gains from the intervention, especially in societies with an unmet need for hospitalization. ■

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## ملخص

### أثر إصلاح النظام الصحي الريفي على معدلات الإدخال إلى المستشفيات في جمهورية إيران الإسلامية: سلسلة زمنية متقطعة

وعلى الرغم من عدم وجود ازدياد أو انخفاض كبير في معدلات الإدخال إلى المستشفيات في مجموعة التدخل أو المقارنة قبل التدخل، إلا أنه لوحظ بعد التدخل وجود ازدياد كبير في معدل الإدخال إلى المستشفيات – 4.6 إدخال إلى المستشفيات لكل 100000 شخص مؤمن عليه لكل شهر في المتوسط – في مجموعة التدخل (الاحتمال  $> 0.001$ ). واستمر الازدياد الشهري في معدل الإدخال إلى المستشفيات لأكثر من سنة واستقر بعدها. ولم يتم ملاحظة أي ازدياد في معدل الإدخال إلى المستشفيات في مجموعة المقارنة.

الاستنتاج أدى برنامج الرعاية الصحية الأولية الذي تم تأسيسه كجزء من عملية إصلاح النظام الصحي إلى زيادة إتاحة رعاية المستشفيات في فئة سكانية كانت تستخدم في السابق خدمات المستشفيات على نحو قليل. ولم يؤد إلى تقليل مرات الإدخال إلى المستشفيات أو الإنفاق المتصل بالإدخال إلى المستشفيات.

الغرض تقييم تأثيرات إصلاح رئيسي للنظام الصحي على معدلات استخدام المستشفيات – برنامج طبيب الأسرة ومخطط الحماية الاجتماعية – الذي تم تنفيذه في المناطق الريفية في جمهورية إيران الإسلامية في عام 2005.

الطريقة تم اختيار مقاطعة "اقتفاء الأثر" التي لم تكن مركزاً لإحالة المرضى من أجل جمع البيانات الشهرية للإدخال إلى المستشفيات على مدار فترة 10 سنوات تقريباً، بدأت قبل عامين من بدء إصلاح النظام الصحي الريفي ("التدخل"). وتم إجراء تحليل سلسلة زمنية متقطعة، وتم استخدام تحليل ارتداد مقسم لتقييم التأثيرات الفورية والتدرجية للتدخل على معدلات الإدخال إلى المستشفيات في مجموعة تدخل مكونة من سكان المناطق الريفية ومجموعة مقارنة مكونة من سكان المناطق الحضرية بالدرجة الأولى.

النتائج كان معدل الإدخال إلى المستشفيات بين سكان المناطق الريفية، قبل التدخل، أقل على نحو كبير عنه في مجموعة المقارنة.

## 摘要

### 伊朗伊斯兰共和国农村卫生体制改革对住院率的影响：中断时间序列

**目的** 评估 2005 年在伊朗伊斯兰共和国农村地区实施的主要卫生系统改革（家庭医生计划和社会保护方案）对住院率的影响。

**方法** 选择一个非病人转诊中心的“示踪”省份，收集大约 10 年的每月住院数据，该期间从农村卫生系统改革（“干预”）开始之前的两年算起。执行中断时间序列分析，使用分段回归分析，评估在由农村居民组成的干预组和主要由城市居民组成的对照组当中此干预对住院率的即时和渐进的影响。

**结果** 在干预之前，农村人口的住院率显著低于对照组。

尽管在干预之前，干预组或对照组中住院率没有显著的提高或下降，但在干预之后，干预组的住院率显著增加——平均每月每十万名参保人 4.6 例住院 ( $P < 0.001$ )。在超过一年时间内，住院率每月提高，之后趋于稳定。对照组中没有看到住院率有所提高。

**结论** 作为卫生体制改革过程的组成部分所制定的初级卫生保健计划，在之前未充分利用医院服务的人群中，提升了使用医院护理的可及性。这没有减少住院或住院相关的支出。

## Résumé

### L'impact de la réforme du système de santé en zone rurale sur les taux d'hospitalisation dans la République islamique d'Iran: une série chronologique interrompue

**Objectif** Évaluer les effets d'une réforme importante du système de santé sur les taux d'utilisation des hôpitaux – un programme introduisant un médecin de famille et un régime de protection sociale – engagée dans les zones rurales de la République islamique d'Iran en 2005.

**Méthodes** Une province «traceur», qui n'était pas un centre d'aiguillage des patients, a été sélectionnée pour recueillir les données mensuelles d'hospitalisation pendant une période d'environ 10 ans; cette collecte a débuté deux ans avant le début de la réforme du système de santé en zone rurale («l'intervention»). Une analyse de la série chronologique interrompue a été menée et une analyse de régression segmentée a été utilisée pour évaluer les effets immédiats et progressifs de l'intervention sur les taux d'hospitalisation dans un groupe d'intervention composé d'habitants des zones rurales et d'un groupe témoin composé principalement d'habitants des zones urbaines.

**Résultats** Avant l'intervention, le taux d'hospitalisation dans la

population rurale était significativement inférieur à celui du groupe témoin. Bien qu'il n'y ait eu ni d'augmentation ni de baisse significatives des taux d'hospitalisation dans le groupe d'intervention ou le groupe témoin avant l'intervention, une hausse significative du taux d'hospitalisation – de 4,6 hospitalisations pour 100 000 personnes assurées en moyenne par mois – a été observée dans le groupe d'intervention après l'intervention ( $P < 0,001$ ). L'augmentation mensuelle du taux d'hospitalisation s'est poursuivie pendant plus d'un an, puis elle s'est stabilisée par la suite. Aucune augmentation du taux d'hospitalisation n'a été constatée dans le groupe témoin.

**Conclusion** Le programme de soins de santé primaires établi dans le cadre du processus de réforme du système de santé a amélioré l'accès aux soins hospitaliers au sein d'une population qui, auparavant, utilisait insuffisamment les services hospitaliers. Il n'a pas diminué les hospitalisations ou les dépenses liées aux hospitalisations.

## Резюме

### Влияние реформы сельской системы здравоохранения на уровень госпитализации в Исламской Республике Иран: прерванный временной ряд

**Цель** Оценить влияние крупной реформы здравоохранения (программа семейных врачей и схема социальной защиты), проведенной в сельских областях Исламской Республики Иран в 2005 году, на уровни использования услуг больниц.

**Методы** Для целей сбора ежемесячных данных о госпитализации в течение примерно 10-летнего периода, начавшегося за два года до осуществления реформы системы здравоохранения в сельской местности («вмешательства»), была выбрана «индикативная» провинция, которая не была центром направления пациентов. Были проведены анализы прерванных временных рядов, а сегментированный регрессионный анализ был использован для оценки непосредственного и постепенного влияния вмешательства на уровни госпитализации в группе вмешательства, включающей сельских жителей, и группы сравнения, состоящей преимущественно из городских жителей.

**Результаты** До вмешательства уровень госпитализации сельского населения был значительно ниже, чем аналогичный уровень

в группе сравнения. Хотя до вмешательства отсутствовало какое-либо существенное увеличение или снижение уровней госпитализации в группе вмешательства или группе сравнения, после вмешательства было отмечено значительное увеличение частоты госпитализаций в группе вмешательства ( $P < 0,001$ ) — на 4,6 госпитализаций на 100 000 застрахованных лиц в среднем за месяц. Ежемесячный рост уровня госпитализаций продолжался более года, а затем стабилизировался. В группе сравнения увеличение уровня госпитализаций не наблюдалось.

**Вывод** Программа первичной медико-санитарной помощи, внедренная в рамках процесса реформирования системы здравоохранения, повысила уровень доступности стационарной медицинской помощи для той части населения, которая ранее в недостаточной мере пользовалась услугами больниц. Она не привела к сокращению числа госпитализаций или расходов на госпитализацию.

## Resumen

### El impacto de la reforma del sistema sanitario rural en las tasas de hospitalización en la República Islámica del Irán: una serie cronológica interrumpida

**Objetivo** Evaluar los efectos sobre las tasas de utilización hospitalaria tras una importante reforma del sistema sanitario (un programa de médicos de familia y un esquema de protección social) realizada en las zonas rurales de la República Islámica del Irán en 2005.

**Métodos** Se seleccionó una provincia «indicadora», que no era un centro de referencia de pacientes, para recabar los datos mensuales de hospitalización durante un periodo de 10 años aproximadamente, el cual comenzó dos años antes de que empezara la reforma del sistema de salud rural (la «intervención»). Se llevó a cabo el análisis de una serie cronológica interrumpida y se empleó un análisis de regresión segmentada para evaluar los efectos inmediatos y graduales de la intervención en las tasas de hospitalización en un grupo de intervención

compuesto por residentes rurales y un grupo de comparación formado principalmente por residentes urbanos.

**Resultados** Antes de la intervención, la tasa de hospitalización de la población rural era considerablemente inferior que la del grupo de comparación. Aunque no hubo un aumento o disminución relevante en las tasas de hospitalización del grupo de intervención o de comparación antes de la intervención, se observó un aumento significativo de la tasa de hospitalización en el grupo de intervención tras la misma. En concreto, un aumento medio de 4,6 hospitalizaciones por cada 100 000 personas aseguradas por mes ( $P < 0,001$ ). El incremento mensual en la tasa de hospitalización continuó durante más de un año y posteriormente se estabilizó. Respecto al grupo



de comparación, no se observó aumento alguno en la tasa de hospitalización.

**Conclusión** El programa de salud de atención primaria instituido como parte del proceso de reforma del sistema sanitario ha aumentado el

acceso a la atención hospitalaria en una población que anteriormente no utilizaba los servicios hospitalarios de forma suficiente. Por otro lado, no ha reducido las hospitalizaciones ni los gastos relacionados con las mismas.

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